1.1.1.1.1.11 Chapter

12

12. Scanning Techniques and Sighting Characteristics Review

12.1 Scanning

Scanning is the process of investigating, examining, or checking by systematic search. In search and rescue operations, the scanner and/or observer visually searches the search area for distress signals or accident indications by using a systematic eye-movement pattern. The observer manages all scanning aboard the search aircraft by assigning an area of responsibility to each individual scanner. When the search aircraft nears the designated search area, the mission observer must ensure that all crewmembers are aware of their respective areas of responsibility and are ready to begin the visual search.

The most commonly used eye-movement pattern involves moving the eyes, and thus the field of view, laterally or vertically while pausing every three to four degrees. This pause is known as a *fixation*. This pattern should be used at a rate that covers about 10 degrees per second.

Search aircraft motion causes the field of view to continuously change, making this scanning technique most appropriate for occupants in the front seats of small aircraft. At side windows of larger aircraft, eye movements are directed away from the aircraft to the effective visibility range and then back to a point close to the aircraft's ground track. The scanner should maintain this routine to systematically cover an assigned sector. The mission observer determines when rest periods are taken, or directs other fatigue-reducing measures. Scanning patterns should be practiced often in order to maintain or increase scanning proficiency.

Your job is to concentrate on scanning for the objective within the search area. Anyone can "look," but scanning is more than just looking. Scanning is the skill of seeing by looking in a methodical way, and there are certain techniques that can help you develop this skill. In this section, we will review these techniques. Remember, like any skill, you need to practice at using the techniques so that your ability to scan remains sharp.

12.2 Vision

Span of Vision

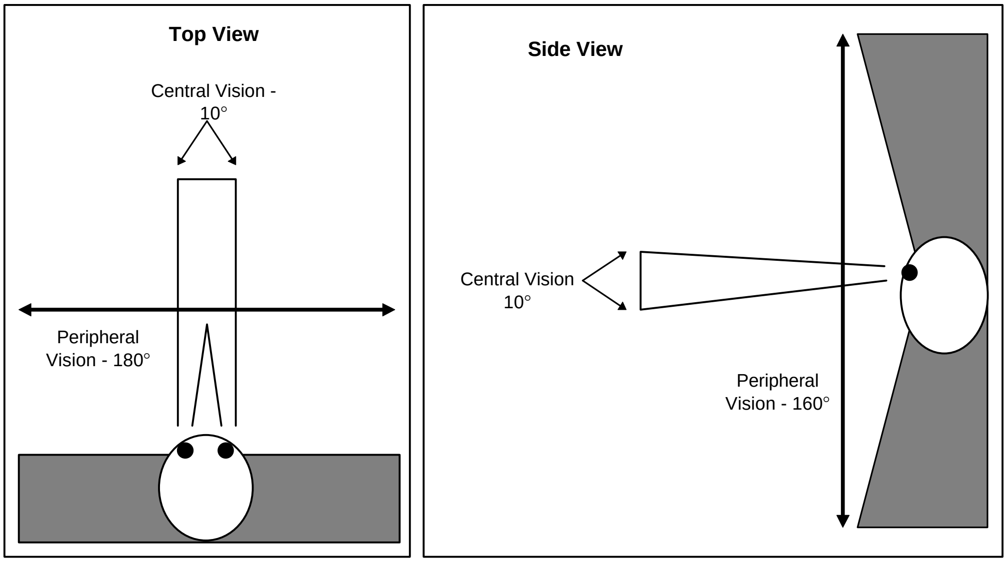

Figure 12-1

The primary tool of the scanner is his eyes. Although an eye is a marvelous device, it has some limitations even when it is in perfect physical condition (which occurs at about ten years of age and degrades steadily thereafter). There also is the problem of interpreting correctly what the eyes convey to the brain.

When a person with normal eyes looks straight ahead at a fixed point, much more than just the point is seen. The brain actively senses and is aware of everything from the point outward to form a circle of 10 degrees. This is central vision, and it is made possible by special cells in the fovea portion of the retina. Whatever is outside the central vision circle also is "picked up" by the eyes and conveyed to the brain, but it is not perceived clearly. This larger area is called peripheral vision; it is produced by cells less sensitive than those in the fovea. However, objects within the peripheral vision area can be recognized if mental attention is directed to them. Figure 12-1 shows the span of human vision.

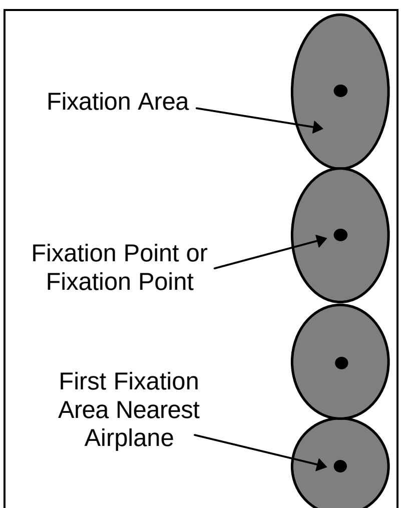

Figure 12-2

The fixation area is the area in which "concentrated looking" takes place. If the search objective happens to come within this fixation area, you probably will recognize it. It is possible to miss a search object even if it is in the fixation area because there are other factors such as fatigue and weather that also influence whether the objective will be recognized.

For central vision to be effective the eye must be focused properly, and focusing takes place each time the eyes are moved. Also, good central vision requires that the eyes be directed straight to the front. Looking sideways, in other words, can reduce the effectiveness of central vision. Why? Very simply, the nose gets in the way. Take a moment and focus on an object well to your right, but keep your head straight. Now close your right eye. See how your nose reduced your vision? These are the reasons why scanners should move their heads while scanning.

12.3 Fixation Points and Line of Scan

When you wish to scan a large area your eyes must move from one point to another, stopping at each point long enough to focus clearly. Each of these points is a fixation point. When the fixation points are close enough, the central vision areas will touch or overlap slightly. Spacing of fixation points should be three or four degrees apart to ensure the coverage will be complete (Figure 12-2). Consciously moving the fixation points along an imaginary straight line produces a band of effective "seeing."

The fist held at arm's length approximates the area of central vision, and you can use this fact to help you practice your scanning technique. Extend your arm at eye level and picture that you are looking through the back of your fist. Look "through" your fist and focus your eyes on the center of the area that would be covered if you were looking at it instead of through your fist. Now move your fist to the right to a position next to and touching the previous area (refer to Figure 12-4). Again, look "through" your fist and focus on the center of the fist-sized area on the other side of your fist. If you continue to move your fist along a line, stopping and focusing your eyes on the center of each adjacent fist-sized area, you will have seen effectively all of the objects along and near that line. You will have "scanned" the line.

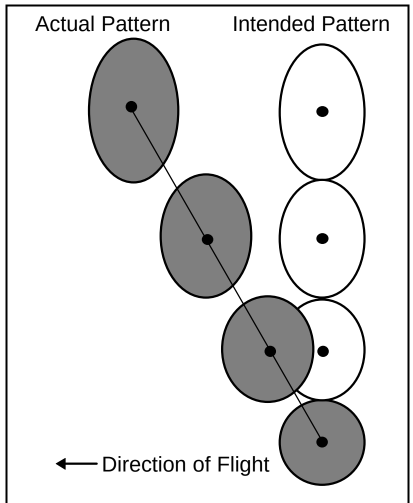

Figure 12-3

Repeat this process, but this time establish starting and stopping points for the line of scan. Pick out an object on the left as the starting point and an object on the right as the stopping point. Start with the object on the left. Extend your arm and look through your fist at that object. As practiced before, continue moving your fist to the next position along an imaginary line between the objects. Remember to stop briefly and focus your eyes. When your eyes reach the object on the right, you will have scanned the distance between the objects.

Follow the same procedure but scan between the two objects without using your fist as a guide. Move your head and eyes to each fixation point as before. Pause just long enough to focus clearly (about 1/3 second). When you reach the object on the right you will have *scanned* the line or area between the two objects and you will have scanned the line in a professional manner.

12.3.1 Fixation area

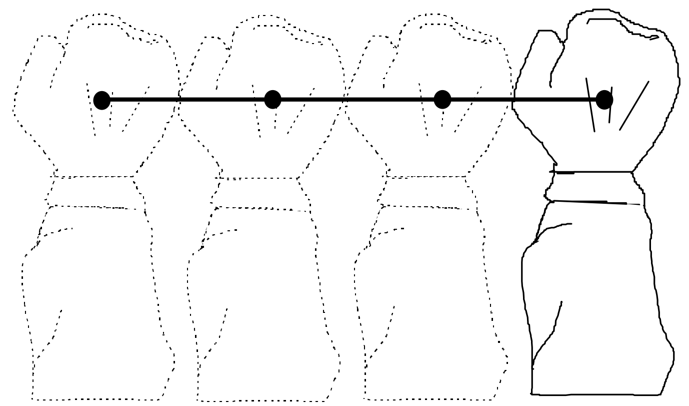

Figure 12-4

The goal of scanning techniques is to thoroughly cover an assigned search area. Reaching this goal on a single overflight is not possible for a number of reasons. First, the eye's fixation area is a circle and the search area surface (ground) is flat. Coverage of a flat surface with circles requires much overlapping of the circles. This overlapping is not possible on a search mission because of the aircraft's motion. Also, the surface area covered by the eye's fixation area is less for the area near the airplane and increases with distance from the airplane. The net result is relatively large gaps in coverage near the airplane and some overlap as distance from the airplane increases. Figure 12-2 is not to scale, but it gives a good idea of how these gaps and overlaps occur. Notice how the surface area covered begins as a relatively small circle near the airplane and takes an increasingly larger and more elliptical shape farther out. Also, Figure 12-3 shows how the forward motion of the aircraft may affect this coverage pattern. You should be aware of this affect and not allow it to cause major gaps in your scanning pattern coverage.

Angular displacement is the angle formed from a point almost beneath the airplane outward to the scanning range, or beyond. By this definition, the horizon would be at 90 degrees displacement. Although the fixation area may be a constant 10-degree diameter circle, the effectiveness of sighting the objective decrease with an increase in this angular displacement. Said another way, your ability to see detail will be excellent at a point near the aircraft, but will decrease as the angular displacement increases. At the scanning range, at which the angular displacement may be as much as 45 degrees, the resolution of detail area probably will have shrunk to a 4-degree diameter circle.

12.3.2 Field of scan

The area that you will search with your eyes in lines of scan is called the field of scan. The upper limit of this field is the line that forms the scanning range. The lower limit is the lower edge of the aircraft window, while the aft (back) limit is usually established by the vertical edge of the aircraft window. The forward (front) limit for a field of scan will vary. It might be established by a part of the airplane (such as a wing strut). Or, when two scanners are working from the same side of the airplane, it might be limited by a pre-agreed point dividing the field of scan.

12.3.3 Scanning Range

We are using the term "scanning range" to describe the distance from an aircraft to an imaginary line parallel to the aircraft's ground track (track over the ground). This line is the maximum range at which a scanner is considered to have a good chance at sighting the search objective. Scanning range sometimes may be confused with search visibility range. Search visibility range is that distance at which an object the size of an automobile can be seen and recognized. Aircraft debris may not be as large as an automobile, and it may not be immediately recognizable from the air as parts of an airplane. Therefore, scanning range can be the same as or shorter than search visibility range.

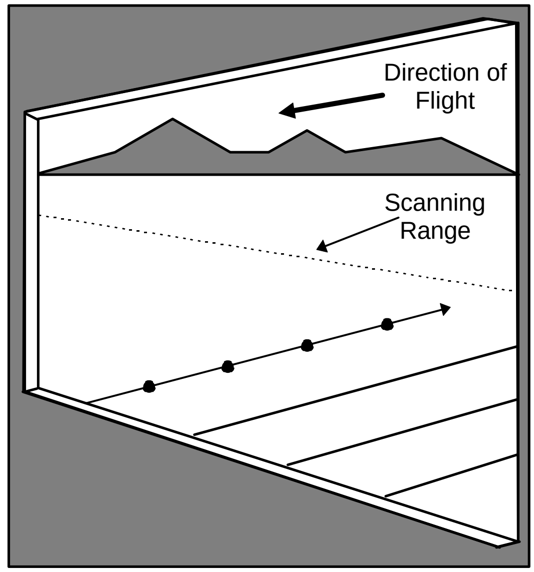

Figure 12-5

If your pilot states that the search altitude will be 500 feet above the ground level (AGL), you can expect your scanning range to be ¼ to ½ mile. If the search altitude is 1,000 feet AGL, you can expect a scanning range of between ½ and 1 mile. Even so, there are many variables that affect both the effective scanning range and your probability of detecting the search objective. These issues are discussed elsewhere in this chapter.

12.4 Scanning patterns

To cover the field of scan adequately requires that a set pattern of scan lines be used. Research into scanning techniques has shown that there are two basic patterns that provide the best coverage. These are called the *diagonal pattern* and the *vertical pattern.*

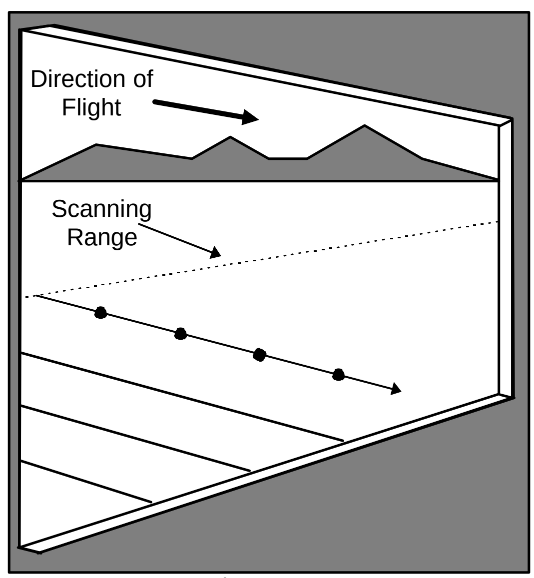

Figure 12-6

Figure 12-5 illustrates the way the diagonal pattern is used when sitting in the right rear seat of a small airplane. This line is followed from left to right as in reading. The first fixation point is slightly forward of the aircraft's position. Subsequent fixation points generally follow the line as indicated in the figure.

The next scan line should be parallel to the first, and so on. Each succeeding scan line is started as quickly as possible after completing the previous one. Remember that the duration of each fixation point along a scan line is about 1/3 second; how long it takes to complete one scan line depends on the distance at which the scanning range has been established. Also, the time required to begin a new scan line has a significant influence on how well the area nearest the airplane is scanned. In other words, more time between starting scan lines means more space between fixation points near the airplane.

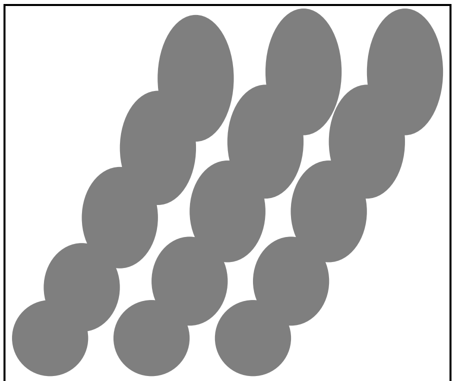

Figure 12-7

When the diagonal scanning pattern is used from the *left* rear window (Figure 12-6), the direction of scan lines still is from left to right, but each line starts at the scanning range and proceeds toward the airplane. Each scan line on this side terminates at the window's lower edge. Figure 12-7 gives you an idea of the surface coverage obtained with a diagonal scanning pattern.

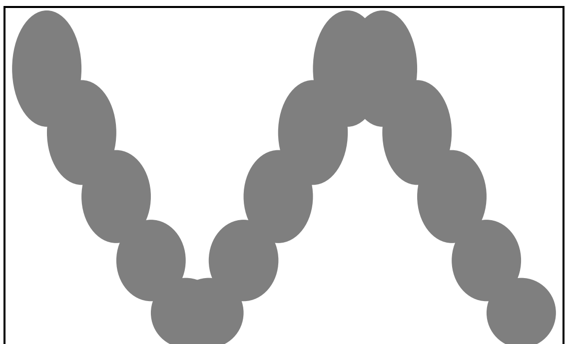

Figure 12-9

The second and somewhat less effective scanning pattern is illustrated in Figure 12-8. This pattern is vertical and is basically the same as the example shown in Figure 12-2. You should use this vertical pattern only from a rear-seat position, and the first fixation point should be as near to underneath the airplane as you can see. Subsequent fixation points for this first scan line should progress outward to the scanning range and back. Figure 12-9 reveals the sawtooth shape this vertical pattern makes on the surface. Observe how much surface area near the airplane is not covered.

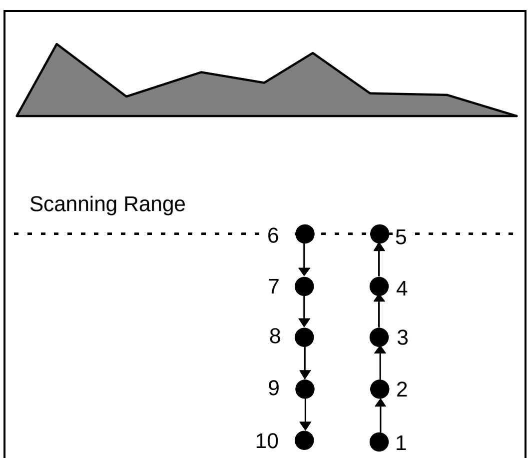

Figure 12-8

If there are two scanners on the same side of the airplane, it is good practice to combine the diagonal and vertical patterns. As agreed between scanners, one would use the diagonal pattern and the other the vertical pattern. However, the scanner using the vertical pattern *would not* scan to the scanning range. Some distance short of the scanning range would be selected as the vertical-pattern limit. This technique provides good coverage of the surface area near the search aircraft.

When flying in the right front seat of an airplane you will use the diagonal pattern. This is true because it is the only pattern that has a natural flow to it from this particular position. Because of the aircraft's structure, you probably will want to begin your scan line near the line of flight over the surface. This will be somewhat ahead of the airplane (not much). The angle of the scan line and its length will be determined by whatever structural part obstructs your vision. For example, you could use the window post on some aircraft as either a starting point or stopping point, depending on your judgment. If you are in the right front seat of a low-wing model, the wing will be the stopping point.

Scanners, especially those with considerable experience, may use a system or pattern that is different from the diagonal and vertical patterns discussed above. Many search objectives were found and many lives were saved long before there was an effort to analyze the scanning process and develop recommendations for its improvement. On the other hand, it is possible that Civil Air Patrol's outstanding search and rescue record would have been better had the scanners of times past used a set pattern and used it consistently.

12.5 Atmospheric and lighting conditions

During darkness, scanners make fewer fixations in their search patterns than during daylight because victims in distress are likely to use lights, fires, or flares to signal rescuers. Contrast between signal light and surrounding darkness eliminates the need for scanners to concentrate on making numerous eye fixations. An attentive scanner or observer should be able to see a light, flare, or fire easily during night operations. Search aircraft interior lighting should be kept to the lowest possible level that still allows normal chart reading. This will help the eyes adjust to the darkness and reduce glare on windshield and window surfaces. Red lights are used when flying at night because that color has little or no affect on the low-light adaptation of the human eye. Regardless of light conditions, a scanner should always maintain a systematic scanning pattern with fixations every few seconds. Darkness merely lengthens the interval between fixations.

12.5.1 Atmospheric conditions

All aircrews hope for perfect visibility during a SAR mission. Seldom does this atmospheric condition exist. Most of the time the atmosphere (especially the lower atmosphere) contains significant amounts of water vapor, dust, pollen, and other particles. These items block vision according to their density. Of course, the farther we try to see the more particles there are and the more difficult it is to sight the objective.

The urgency of finding a downed aircraft may require flight under marginal conditions of visibility. An example here is flight through very light rain or drizzle. Another example is flight during the summertime when the air is not moving appreciably. It may become virtually saturated with pollutants.

12.5.2 Position of the sun

Flying “into the sun” soon after it rises in the morning or before it sets in the afternoon, poses visibility problems. No doubt you have had this experience while driving or riding as a passenger in an automobile. Recall how difficult it is to distinguish colors and to detect smaller objects.

Research in search and rescue techniques has determined that the best time to fly search sorties is between mid-morning and mid-afternoon. This is when the sun is about 30 degrees or more above the horizon. When the sun is below this angle, it intensifies visibility problems.

As the sun climbs higher in the sky it helps to relieve visibility problems caused by the presence of particles in the atmosphere. The sun’s rays heat the ground and the atmosphere. This heat causes the lower atmosphere to expand. As the atmosphere expands the particles it contains are spread farther apart, decreasing their density within a given volume. Therefore, there are fewer particles between the surface and the scanner’s eyes and the effective scanning range is increased slightly.

12.5.3 Clouds and shadows

Shadows produced by clouds can reduce the effective scanning range. This is due to the high contrast between sunlit area and shadows. Our eyes have difficulty adjusting to such contrasts. The same effect occurs in mountainous areas where bright sunlight causes the hills and mountains to cast dark shadows.

12.5.4 Terrain and ground cover

If flat, open, dry areas were the only areas to be searched, the scanner’s job would be easy. Most aircraft crashes do not happen in such areas; when one does happen, it usually is found quickly without an intensive search effort.

The more intensive search efforts occur over terrain that is either mountainous or covered with dense vegetation, or both. Mountainous area searches demand frequent variation in the scanning range. This you can visualize fairly easily; at one moment the mountain or hill places the surface within, say 200 feet of the aircraft. Upon flying past the mountain or hill the surface suddenly may be a half-mile away.

Forested areas can reduce the effective scanning range dramatically. This is especially true during spring, summer, and fall when foliage is most pronounced. The situation doesn’t change for the better in the winter where trees are of the evergreen type (e.g., pine and spruce) because the height of the trees plus their foliage masks the search objective very effectively. Frequently the only way for a scanner to actually spot an objective under such circumstance is to be looking down almost vertically. There are other signs to look for in such areas, but we will discuss them later.

12.5.5 Surface conditions

Here we are thinking of snow, primarily. Even a thin covering of new snow will change the contour, or shape, of a search objective. Also, the light-reflective quality of snow affects visual effectiveness. The net result is a need to bring the scanning range nearer to the aircraft.

12.5.6 Cleanliness of window

This might seem to be a very minor factor. On the other hand, it is estimated that the scanner's visibility can be reduced up to 50 percent if the aircraft window isn't clean. If you discover this to be the case in your aircraft, clean the window yourself. Aircraft windows are made of plastic and easily scratched, so it is important to use the proper cleaning materials. A supply should be kept in all CAP aircraft for just this purpose.

12.5.7 Condition of the scanner

Your general physical welfare will influence how well you do your job. For example, if you have a cold or sinus trouble you may feel so bad you cannot concentrate on scanning. In effect, this reduces your personal effective scanning range to "zero." Only you can determine your fitness to fly and do the job expected of you. If you do not believe that you feel up to the job at the moment, ask for a non-flying assignment. You will be more highly regarded if you know your own limits.

Our discussion of variables could be extended considerably because most anything that happens during a sortie could affect the scanning operation. However, the variables of major importance have been discussed.

12.6 Visual clues

12.6.1 Sighting Characteristics

Objects appear quite different when they are seen from above and at a greater distance than usual. We will review some visual clues, what you might expect in aircraft wreckage patterns, signals which survivors might be expected to use, and some false clues which are common to selected areas.

12.6.2 Typical Visual Clues

Anything that appears to be out of the ordinary should be considered a clue to the location of the search objective. In addition to this piece of advice, the following are specific clues for which scanners should be looking:

Light colored or shiny objects - Virtually all aircraft have white or other light colors as part of their paint schemes. Some aircraft have polished aluminum surfaces that provide contrast with the usual ground surface features. Also, bright sunlight will "flash" from aluminum surfaces.

Aircraft windshields and windows, like aluminum, have a reflective quality about them. If the angle of the sun is just right, you will pick up momentary flashes with either your central or peripheral vision. A flash from any angle deserves further investigation.

Smoke and fire - Sometimes aircraft catch fire when they crash. If conditions are right, the burning airplane may cause forest or grass fires. Survivors of a crash may build a fire to warm themselves or to signal search aircraft. Campers, hunters, and fishermen build fires for their purposes, but no matter what the origin or purpose of smoke and fire, each case should be investigated.

Blackened areas - Fire causes blackened areas. You may have to check many such areas, but finding the search objective will make the effort worthwhile.

Broken tree branches - If an airplane goes down in a heavily wooded area, it will break tree branches and perhaps trees. The extent of this breakage will depend on the angle at which the trees were struck. The primary clue for the scanner, however, will be color. As you no doubt realize, the interior of a tree trunk or branch and the undersides of many types of leaves are light in color. This contrast between the light color and the darker foliage serves as a good clue.

Local discoloration of foliage - Here we are talking about dead or dying leaves and needles of evergreen trees. A crash that is several days old may have discolored a small area in the forest canopy. This discoloration could be the result of either a small fire or broken tree branches.

Fresh bare earth - An aircraft striking the ground at any angle will disturb or "plow" the earth to some degree. An overflight within a day or so of the event should provide a clue for scanners. Because of its moisture content, fresh bare earth has a different color and texture than the surrounding, undisturbed earth.

Breaks in cultivated field patterns - Crop farmlands always display a pattern of some type, especially during the growing season. Any disruption of such a pattern should be investigated. A crop such as corn could mask the presence of small aircraft wreckage. Yet the pattern made by the crashing airplane will stand out as a break in uniformity.

Water and snow - Water and snow are not visual clues, but they often contain such clues. For example, when an aircraft goes down in water its fuel and probably some oil will rise to the water's surface making an "oil slick" discoloration. Other material in the aircraft may also discolor the water or float as debris. If the aircraft hasn't been under the water very long, air bubbles will disturb the surface. Snow readily shows clues. Any discoloration caused by fire, fuel or debris will be very evident. On the other hand, do not expect easy-to-see clues if snow has fallen since the aircraft was reported missing.

Tracks and signals - Any line of apparent human tracks through snow, grass, or sand should be regarded as possibly those of survivors. Such tracks may belong to hunters, but it pays to follow them until the individual is found or you are satisfied with their termination-at a road, for example. If you do find the originator of such tracks and the person is a survivor, no doubt he will try to signal. More than likely this signal will be a frantic waving of arms.

Birds and animals - Scavenger birds (such as vultures and crows), wolves, and bears may gather at or near a crash site. Vultures (or Buzzards) sense the critical condition of an injured person and gather nearby to await the person's death. If you see these birds or animals in a group, search the area thoroughly.

False clues - In addition to the false clues of camp fires and other purposely set fires, there are others of which you should be aware; oil slicks may have been caused by spillage from ships. All aircraft parts may not have been removed from other crash sites. Some of the aircraft parts may have been marked (with a yellow "X"), but you may not be able to see the mark until near the site because the paint has faded or worn off with age.

In certain parts of the country, you will encounter many false clues where you would not ordinarily expect to see them. These false clues are discarded refrigerators, stoves, vehicles and pieces of other metal, such as tin roofing. What makes these false clues unique is that they are in areas far from towns and cities.

Survivors and Signals - If there are survivors and if they are capable of doing so, they will attempt to signal you. The type of signal the survivors use will depend on how much they know about the process and what type signaling devices are available to them. Here are some signaling techniques that survivors might use:

- A fire - Most people carry some means of starting a fire. And a fire probably will be the survivor's first attempt at signaling. The smoke and or flames of a fire are easily seen from the air, as we pointed out earlier.
- A group of three fires.
- Three fires forming a triangle is an international distress signal.
- Red smoke, white smoke, or orange smoke.
- Colored smoke is discharged by some types of signaling devices, such as flares. Other flares are rocket types; some send up a small parachute to which a magnesium flare is attached.
- Signal mirrors - If the sun is shining, a signal mirror is the most effective signaling device. A special survival signal mirror includes instructions to the survivor on how to aim the signal at the search aircraft. Pocket mirrors will also work but aiming them may not be as easy.
- Panels on the ground - This type signal can be formed with white panels or with colored panels especially designed for the purpose. Of course, survivors may be able to arrange aircraft parts as a signal.

Messages - There are a number of methods and materials which survivors can use to construct messages. In snow, sand, and grassy areas, survivors may use their feet to stamp out simple messages, such as HELP or SOS. More than likely such messages will be formed with rocks, tree branches, driftwood, or any other similar materials. Such materials may also be used to construct standard ground-to-air signals. These signals are familiar to military and professional civilian pilots, including CAP pilots. Ground-to-air signals are normally carried in CAP aircraft for reference.

Nighttime signals - For various reasons, nighttime air searches are infrequent. Flights will be at 3,000 AGL or higher, and you will not need to use the scanning patterns discussed earlier.

A fire or perhaps a flashlight will be the survivor's means of signaling. On the other hand, a light signal need not be very bright; one survivor used the flint spark of his cigarette lighter as a signal; his signal was seen and he was rescued.

12.7 Wreckage patterns (accident signs)

Frequently, there are signs near a crash sight that the aircrew can use to locate the actual wreckage. The environment plays a major role in sighting the signs from the search aircraft. In crashes at sea, searchers may be unable to locate the crash site as rough seas can scatter wreckage or signs quickly. On land, the wreckage may be in dense foliage, which can obscure it in a matter of days. By knowing signs to look for, the scanner can improve the effectiveness of each sortie.

Common signs of accidents include:

- light colored or shiny objects.
- sunlight reflected off metal.
- people.
- distress signals.
- blackened or burned areas.
- broken tree branches.
- fresh or bare earth.
- discolored water or snow.
- tracks or movement patterns in snow, grass, and sand.
- excessive bubbles in water.
- oil slicks, floating debris, or rafts on water.
- smoke.
- deep furrows in fields or snow.
- abnormalities in the environment.

In general, don't expect to find anything that resembles an aircraft; most wrecks look like hastily discarded trash. However, certain patterns do result from the manner in which the accident occurred. These patterns are described as:

12.7.1 Hole in the ground

Caused from steep dives into the ground or from flying straight into steep hillsides or canyon walls. Wreckage is confined to a small circular area around a deep, high-walled, narrow crater. The structure may be completely demolished with parts of the wings and empennage near the edge of the crater. Vertical dives into heavily wooded terrain will sometimes cause very little damage to the surrounding foliage, and sometimes only a day or two is needed for the foliage to repair itself.

12.7.2 Cork screw or auger

Caused from uncontrolled spins. Wreckage is considerably broken in a small area. There are curved ground scars around a shallow crater. One wing is more heavily damaged and the fuselage is broken in several places with the tail forward in the direction of the spin. In wooded areas, damage to branches and foliage is considerable, but is confined to a small area.

12.7.3 Creaming or smear

Caused from low-level "buzzing", or "flat hatting" from instrument flight, or attempted crash landing. The wreckage distribution is long and narrow with heavier components farthest away from the initial point of impact. The tail and wings remain fairly intact and sheared off close to the point of impact. With power on or a windmilling propeller, there is a short series of prop bites in the ground. Ground looping sometimes terminates the wreckage pattern with a sharp hook and may reverse the position of some wreckage components. Skipping is also quite common in open, flat terrain. In wooded areas, damage to the trees is considerable at the point of impact, but the wreckage travels among the trees beneath the foliage for a greater distance and may not be visible from the air.

12.7.4 The Four Winds

Caused from mid-air collisions, explosion, or in-flight break up. Wreckage components are broken up and scattered over a wide area along the flight path. The impact areas are small but chances of sighting them are increased by the large number of them. Extensive ground search is required to locate all components.

12.7.5 Hedge-trimming

If an aircraft strikes a high mountain ridge or obstruction but continues on for a considerable distance before crashing. Trees or the obstruction are slightly damaged or the ground on the crest is lightly scarred. Some wreckage components may be dislodged; usually landing gear, external fuel tanks, cockpit canopy, or control surfaces. The direction of flight from the hedge-trimming will aid in further search for the main scene.

12.7.6 Splash

Where an aircraft has gone down into water, oil slicks, foam, and small bits of floating debris are apparent for a few hours after the impact. With time, the foam dissipates, the oil slicks spread and streak, and the debris become widely separated due to action of wind and currents. Sometimes emergency life rafts are ejected but, unless manned by survivors, will drift very rapidly with the wind. Oil slicks appear as smooth, slightly discolored areas on the surface and are in evidence for several hours after a splash; however, they are also caused by ships pumping their bilges and by offshore oil wells or natural oil seepage. Most aircraft sink very rapidly after ditching.

12.8 Reducing fatigue effects

The art of scanning is more physically demanding and requires greater concentration than mere sight seeing. In order to maintain the effectiveness of all scanning crewmembers, an observer must be aware of his own fatigue level, and that of the scanner or scanners. The following tips can help the observer direct appropriate actions and maintain scanning effectiveness:

- Change scanning positions at 30- to 60-minute intervals, if aircraft size permits.
- Rotate scanners from one side of the aircraft to the other, if two or more scanners are present.
- Find a comfortable position, and move around to stretch when necessary.
- Clean aircraft windshields and windows. Dirty windows accelerate onset of eye fatigue, and can reduce visibility by up to 50 percent.
- Scan through open hatches whenever feasible.
- At night, use red lights and keep them dimmed to reduce reflection and glare.
- Use binoculars to check sightings made first by the naked eye.
- Focus on a close object (like the wing tip) on a regular basis. The muscles of the eye get tired when you focus far away for and extended period of time.